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No. 88

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WEST EUROPE REPORT

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CONTENTS

ELECTRONICS

PHILIPS ANNOUNCES ITS FIRST C-MOS UNCOMMITTED CIRCUIT

Paris ELECTRONIQUES ACTUALITIES in French 20 Nov 81 p 14

[Text] On 17 November, Philips officially announced in London its first uncommitted C-MOS reference circuit, the PC 700. It is compatible with the C-MOS 4000 family and is relatively complex since it integrates 352 8-transistor cells (4 P-MOS and 4 N-MOS) and has 2 interconnection planes at the chip surface, a polycrystalline silicon, and an aluminum one. RTC [Radiotechnique Competec] will begin marketing this circuit in early 1982. RTC will be designing the circuits based on schematics and test sequences provided by the customer. Samples will be provided 12 to 20 weeks later. Important users will be able to have access to RTC's computerized tools and turn-around time will then be reduced to 7 to 10 weeks after completion of the mask-generation tape. According to RTC, the polycrystalline silicon channel concept used in this circuit would permit a utilization rate of up to 90 percent.

2000-Gate, 1 to 2 ns ISL [Integrated Schottky Logic] Circuits Are Being Prepared

The line of uncommitted digital circuits offered by RTC will therefore be quite complete since it will allow personnalization of circuits compatible with the three main basic logic families currently available: the 100K ECL family (HXA 220 and HXA 230), the TTL-LS family (8A ISL 1200, 1260, and 1542), and the 4000B C-MOS family (PC 700). Currently, Philips/Signetics' main effort is on the latter two families since they are the object of the greatest number of new orders. Thus, whereas a single 1144 gate 8A 1200 circuit was offered in the last 2 years in ISL technology, the family of these 4 ns/168 mW gate circuits starts with the 8A 1260 circuit which is identical, except that it has 60 I/O's instead of 36, and with the 8A 1542 circuit which has 1500 gates and 42 I/O's. These two-interconnection-level circuits can call upon the same technology as standard TTL-LS circuits and they are available in a military spec temperature range. In parallel, Signetics is refining their LS technology. This work should result in 1 to 2 ns/2000-gate ISL circuits and about 100 I/O's before 1983. By then, a new 4 ns circuit should be offered. Let us note that the RTC Caen plant would be able to produce very fast ISL oxide-insulated circuits if the market requires.

A 3 to 9 MHz C-MOS Circuit

With uncommitted ECL and ISL circuits, the user is supposed to define the circuit personalization. In order to do this, he uses function libraries, a simulation program, and a test generation program. Automatic interconnection testing is carried out but, in the case of ISL circuits, the interconnection itself is still made with mylar.

The uncommitted C-MOS being announced today is a 700-gate model (2-input equivalent) with 38 I/O's implemented in a DIL module with 40 or 28 pins. Supplies are 3 to 15 volts and the minimum clock frequency is 3 MHz at 5 volts, 6 MHz at 10 volts, or 9 MHz at 15 volts. With a fan-out of 2, its propagation time for a typical gate is 20 ns at 5 V, 10 ns at 10 V, or 7 ns at 15 V. Power consumption is 1 mW at 10 V in the idle state and the operating temperature range is - 40°C to +85°C.

The PC 700 is organized as a network of gates rather than a network of cells. Philips has developed a library of 48 basic functions that it is practical to use in order to save design time. Design therefore consists in developing a logic diagram from these basic functions, and then doing the layout and interconnection using the two available levels. A logic simulation program makes the work easier, as does an automatic circuit interconnection program.

Finally, the mask generation tape is obtained automatically, as is verification and generation of the test tape. This work is currently carried out using in-house computers, but Philips is currently adapting its tools to IBM and VAX equipment.

In the case of a development effort carried out by RTC, the cost of the first sample will be around 80,000 to 150,000 francs. If development is done by the user, the cost drops to about 50,000 francs from the time of delivery of the mask generation tapes. Starting in early 1982, a complete family of uncommitted 500 and 1700 gate C-MOS circuits will be offered.

Three Pre-characterized Circuit Families

In parallel, RTC offers its customers pre-characterized integrated circuits (circuits designed on request from basic library functions, which speeds design and reduces costs) already available from Signetics in the US. Three TTL compatible families implementing various combinations of transistors for the basic gates are being offered. All are offered in civilian and military temperature ranges. In the case of these circuits, users perform their own logic simulation and do their own mask design using self adhesive masking material; but the company's computerized tools are available to them. In practice, RTC considers that this solution is advantageous the case of circuits having less than 500 gates. Beyond that point, the circuit density coefficient becomes similar or worse than in the case of uncommitted circuits. Nevertheless, it is technically possible to go up to 100 gates.

The first library, called EPL, uses elementary gate schematics similar to the TTL-LS in order to make up the basic functions. Noise immunity is 300 mV with a fan of 15 and the speed is 4.5 ns with a fan-out of 1 or 5.5 ns with a fan-out of 6 (5.5 ns and 7.5 ns respectively when power consumption is reduced to 2.6 mW per gate instead of 5.6 mW). Circuit density is on the order of 14 to 42 gates per mm^2. Currently, the library includes 80 basic functions plus 14 input cells, 22 internal cells, and 12 output cells (8 mA, 20 MA, and 80 mA).

The so-called STL library uses a Schottky IIL basic cell with open output collector and multiple input emitter. Its characteristics are very similar to the EPL cells, except that noise immunity is only 128 mV, with a fan-out of 6 and operation is specified only over the civilian temperature range for the normal family. The library currently includes 68 functions, plus 16 input interfaces, 8 output interfaces, 22 low consumption internal gates, and 22 high speed internal gates.

Finally, the so-called ISL library uses the same technology as the company's uncommitted ISL circuits. Its characteristics are quite different from the other two: Noise immunity is 70 mV only with a fan-out of 6; power supplies are 5 V and 1.5 V (instead of 5 V for the other families); circuit speeds are 6 ns with a fan-out of 1 and 2 ns with a fan-out of 6 power consumption of .3 mW only; possible circuit density of 26 to 78 gates/mm^2, which results in chip surfaces of 30 to 50 percent of those of the EPL chips. The library currently includes 99 functions plus 9 input cells, 30 internal cells, and 13 output cells (also 8 mA, 20 mA, and 80 mA). A similar library exists for C-MOS circuits (it is being used by Philips in particular to assemble its 4000B family, a standard function) but it is not currently being offered outside the Philips/RTC group.

6445
CSO: 3102/57

ELECTRONICS

PHILIPS DEVELOPS C-MOS NONVOLATILE MEMORY

Paris ELECTRONIQUES ACTUALITES in French Nov 81 p 12

[Text] Next December, Philips RTC [Radiotechnique Competec] is expected to market samples of its first nonvolatile MNOS cell C-MOS memory. The product is the 16-bit C-MOS nonvolatile PCB 1400 memory, compatible with the famous General Instruments ER 1400 MNOS memory. Memories compatible with the I^2C series bus and the standard 16 Kbits model 2816 to be introduced in 1982 will follow the RTC line. These memories will be produced in the group's Faselec plant in Zurich.

An Improved Version of the 1400 Memory

Coming more than 5 years after the ER 1400, it is only to be expected that the PCB 1400 presents many advantages over the latter. Some pins which were normally connected to ground in the ER 1400 are now handling additional functions such as chip selection, authorization of function, test, or regulated output. The ground voltage, Vss, of the first imission must be brought to 5 volts in the second, becoming a Vdd voltage. All the input and output levels of the PCB 1400 are between 0 and 5 volts. For instance, the input voltage, Vil, which is variable between -10V and -3V in the ER 1400 must be between o and 1 volt in the PCB 1400. The output voltage Vol, is now set at .4 volt with a current of 2 mA (-7 volts on a 1.5 M load in the ER 1400) and the Voh is 2.5 volts with a current of .5 mA. In short, power consumption is reduced from 8 mA to 2 mA.

Contrary to its predecessor, the PCB 1400 does not have a narrow clock frequency limitation: it can vary from continuous DC to 125 kHz (11.2 to 16.8 kHz in the ER 1400). Also, it has no fixed operating cycle ratio (pulse width from 3 μs to infinity). Finally, it is recommended to use a single 10 ms pulse only for write and erase. It is to be noted that data retention is guaranteed to be 10 years and can take more than 10,000 write/erase cycles.

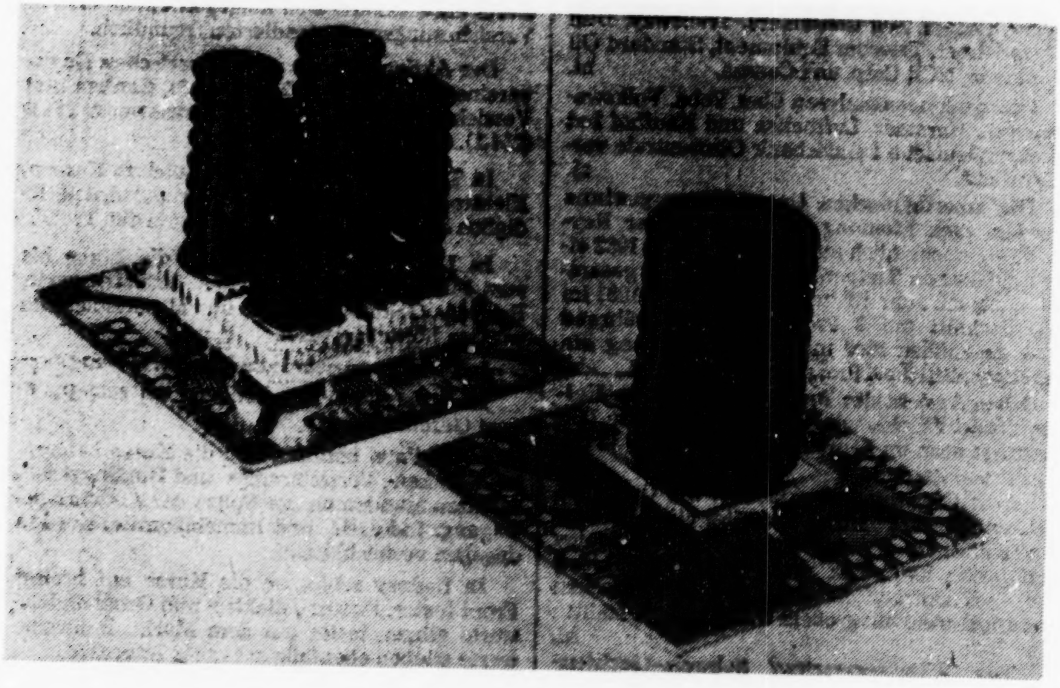
6445
CSO: 3102/57

ELECTRONICS

SIEMENS INTRODUCES CONCEPT OF COOLING TOWERS ON CHIPS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 1 Dec 81 p 5

[Text]



Computer chips use very little energy when in operation. But a great part of it is converted into radiated heat. The more tightly the logic circuits are concentrated, the more dangerous their self-generated heat can become to them.

Siemens has therefore developed a new design in which small cooling towers on the components provide rapid heat dissipation. Together with a new type of horizontal ventilation, regulation of computers' internal temperature and the conditions for installation will be simplified considerably. Siemens is using this type of component in its new family of large computers.

9581
CSO: 3102/90

BRIEFS

UK, JAPAN ROBOTICS VENTURE--The British oil producer Sykes has signed an agreement with the Japanese robot company Dainichi to form a joint venture firm in the robot industry. According to plans the new company, which will be called Dainichi-Sykes Robotics, will be located near Leyland where Sykes already has a plant. According to a representative of Dainichi, the British will invest about 4.7 million pounds in the new company. According to the agreement the new company will produce Dainichi's robots for the entire European market. In the beginning, however, it will only market robots produced in Japan. Dainichi has a production capacity of 20 robots per month and is a medium-sized company by Japanese standards. The assortment includes seven different robots for arc and spot welding and assembly, among other things. [Text] [Sundbyberg MODERN ELEKTRONIK in Swedish 16 Oct 81 p 49] 9336

CSO: 3102/86

FRG, FRANCE: JOINT EFFORT TO DEVELOP MAGNETIC LEVITATION

Duesseldorf VDI NACHRICHTEN in German 13 Nov 81 p 1

[Article by Ralf Roman Rossberg: "Magnetic Levitation Development on Two Tracks Again"]

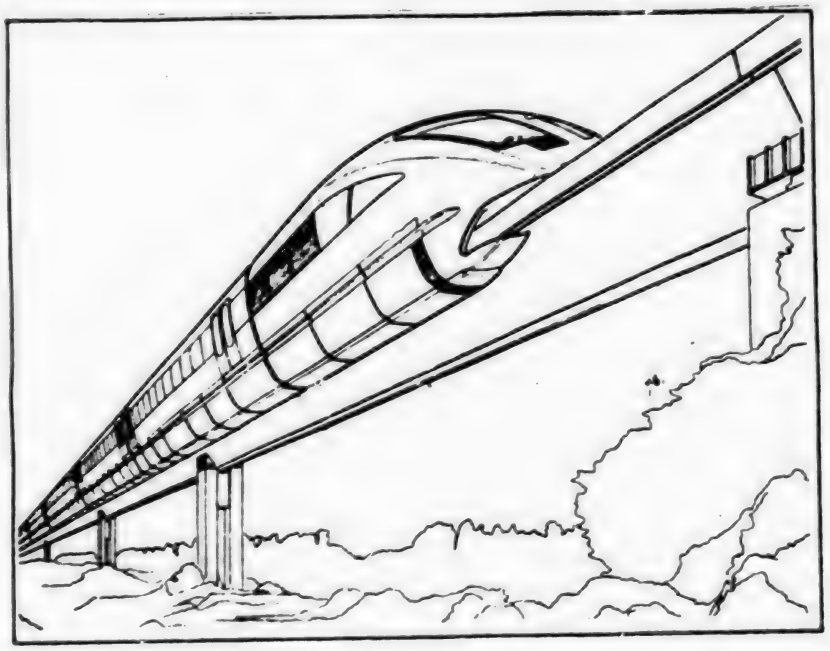
> [Text] While a test track of more than 30 kms is already under construction in Emsland and is almost ready for use, the current stage of development of an "interesting alternative" which is to be continued through Franco-German cooperation was shown as part of a bilateral presentation in Grenoble at the end of October. After 4 years, "money from Bonn" is again flowing into two developments, but for the time being the main emphasis will remain on the "Transrapid Project" in Emsland.

The decision of the Ministry for Research and Technology (BMFT) in 1977 to support only one version fundamentally affected the propulsion and guidance systems, which are the basic parts of magnetic levitation technology. In the systems competition, which has now been renewed, the object is the optimal form of propulsion. At the Emsland track a linear motor with an iron-bound stator is used to drive the magnetic levitation vehicle. In this technology, the active part of the linear motor is integrated into the track; all the energy for propulsion can be fed into a stationary system. The high cost of equipping the track and promising new developments in short-stator linear motors have resulted in the short-stator version being included in the studies again. In this version, the track has a passive reaction rail, the propulsion part of the linear motor is installed in the vehicle. Costs for equipping the track are reduced to between 30 and 40 percent of the long-stator version. However, the entire power unit must now be installed in the vehicle and energy has to be transmitted to it. A magnetic railroad using short-stator linear motors is given the best chance mainly in the speed range around 300 km/hour and with a lighter traffic load, long-stator propulsion is given better chances at high speeds around 500 km/hour and with heavy loads.

The Franco-German agreement is seen as another step on the way to the magnetic railroad. In this area it calls for the development of a contact-free, high-speed traffic system with a U-shaped short-stator linear motor and electromagnetic propulsion and guidance technology. The propulsion unit is being built by the French Celduc company in Sorbier, the propulsion and guidance technology

by Thyssen-Henschel in Kassel. The German company is also responsible for the vehicle design, safety equipment, the track and the application studies.

The core of a vehicle for the short-stator magnetic railroad is to be tested on a rotary test stand at the French Institute for Transportation Research (IRT) in Grenoble. It will consist of the propulsion and guidance system, which underwent further development in a different direction from the technology in Emsland, the appropriate control technology and the newly built short-stator linear motor from the Celduc company. A 12-meter diameter wheel simulates the track, at the circumference of which the U-shaped reaction rail is mounted. The guidance and propulsion module can then be mounted solidly on a frame above the wheel. This arrangement allows every possible disturbing influence to be studied.



This is how the partners in the Franco-German magnetic rail project envision the expected result of their development: Several nondriven cars to transport passengers or containers follow a short "driving unit" which contains the extensive onboard technology.

9581
CSO: 3102/90

TECHNICAL IMPROVEMENTS ON BMW PRODUCTS DESCRIBED

Turin ATA in Italian Sep 81 pp 528-534

[Article by J.P. Norbye: "Technical Progress at BMW"]

[Text] One of the few automobile industries whose products do not too obviously reflect the fact that the price of oil has quintupled since 1973, or the compelling need to reduce fuel consumption, is BMW (Bayerishce Motoren Werke, of Munich).

The firm's spokesmen stress that their automobiles were already light and efficient before the "oil crisis" and that further improvements have been made continually, in accordance with the principles and the philosophy of a firm that in 1980 produced 330,000 cars (as against 328,000 in 1979).

The technical director, Dr Karlheinz Radermacher, declares: "We have managed to reduce the average fuel consumption of the 1981 range by 10 percent as compared with the 1979 range. This has been possible also through the use of improved combustion chambers, the shortening of engine warmup times, adoption of the digital electronic installation and wider use of fuel injection. Greater fuel savings have been achieved by reduction of the aerodynamic resistance and the weight of our cars."

The fact remains, though, that BMW cars do not have a particularly aerodynamic profile and that BMW has not shown the same concern as regards weight as have other builders.

The aerodynamic coefficients of the 1981 BMW models vary from 0.39 (for series 7) to 0.445 (for series 3).

BMW recently completed construction of a wind tunnel, and Dr Radermacher expects the average car to have a $Cx \approx 0.32$ in 1990.

What will the future buyer of a BMW be able to expect? The car will be much lighter, and the shapes of the future will concentrate on aerodynamic profiling. On the other hand, the dimensions should not change much. The relative position and dimensions of the driver-passenger compartment are nearly invariable.

The norms set by law (safety, etc) determine many other design factors which then influence both form and structure. The most notable changes in the future of the BMW concern the transmission. In about 3 years, BMW has achieved various interesting alternatives to the present engines and gearing.

The Eta Engine

The Eta is a high-compression engine running on super gasoline and optimized for keeping fuel consumption down. Production of it has already been decided on, and it will be available as an option in some 1982 BMW models.

BMW has named it the Eta, from the Greek letter used by technicians as a symbol for efficiency. The main purpose of the Eta concept has been to diminish the factors that act as parasites on the power produced by the traditional engine.

The basis of the Eta is the M-60 engine, with 80-mm diameter and stroke lengthened from 76.8 to 80 mm, with displacement increased from 2,316 cm^3 to 2,413 cm^3.

The standard cylinder head has been retained, with valves at 44° to one another, while new pistons have been installed that raise the compression ratio from 9.5:1 to 12-13:1.

In place of the K-Jetronic injection unit (mechanical, with continuous delivery) of the BMW 320i, the Eta engine has the Bosch L-Jetronic unit (electronic injection with air-mass dosage).

New cam profiles have been designed so as to obtain not so much high-speed performance charactersitics as torque at the lower speeds. Since internal friction losses increase as the square of shaft speed, BMW's technicians have worked out the characteristics of intake at the low speeds.

The torque curve has been flattened out, and the maximum value has been lowered from 4,000 to 3,000 RPM. Maximum torque has been increased by 15 percent to 220 Nm. The maximum power value has not been considered significant, provided that it is obtained at relatively low speeds.

The maximum-power engine speed has been reduced from 5,800 to 4,500 RPM, with a corresponding power drop from 105 kW to 90 kW. In the light of these modifications, it has been essential to adapt the gearing so as to obtain far longer total ratios.

According to BMW, the six-cylinder engine is the most suitable for such modifications, inasmuch as it is of appropriate unit displacement (402 cm^3), with combustion chamber more compact than is obtainable with a four-cylinder engine with similar displacement.

In addition, the four-cylinder engines tend to run rough under heavy load at low speeds, while the six-cylinder engines maintain their regularity down to the minimum.

BMW's technicians assert that it has been possible to reduce the losses from mechanical friction to below the level achieved by reducing rotation speed, as the result of a number of modifications that it has been possible to achieve by reduction of speed. The noise level also proves considerably reduced.

By carefully adapting the transmission ratios to the Eta engine, BMW has achieved a test prototype that has performance characteristics similar to those of the BMW 320i,

with the same behavior under acceleration and the same driving characteristics, with average fuel consumption comparable to that of a diesel engine--specifically, a 15-percent improvement over the BMW model 323i of 1981.

The TZA Engine

TZA (Teillast-Zylinder-Abschaltmotor [partial-load cylinder-cutoff engine]) is the acronym for the partial-load cylinder-cutoff system, which enables a six-cylinder engine to function on three cylinders when maximum power is not required. This involves the same principle as adopted by Cadillac for the V-8 engine, although the method is completely different.

While Cadillac uses an Eaton system that blocks the valves of the cylinders temporarily cut off, BMW simply interrupts the fuel supply to the preselected cylinders, letting them turn over with the throttle wide open. According to BMW, the Cadillac solution is more expensive and less efficient. The V-8 engine, being less elastic, cannot pass from eight-cylinder to four-cylinder functioning without going through the intermediate stage of six-cylinder functioning. In addition, this system is available only on Cadillacs with automatic transmission, not on those with manual.

The TZA engine is equipped with electronic fuel injection, which implies practically no additional cost for the device for automatically cutting off fuel to the three deactivated cylinders under low-power operating conditions. BMW has also subdivided the intake and exhaust manifolds in such a way that the three cylinders cut off take in the high-pressure exhaust gases coming from the three active cylinders. This provides considerable recovery power that minimizes the pumping losses due to the functioning of three cylinders that are empty, while the exhaust gases keep the inoperative cylinders hot, thus avoiding an increase in friction and wear.

The distribution does not necessitate any modifications. With the cutting-off of the fuel supply and injection of it into cylinders 1, 2 and 3, the engine turns in a regular manner with equidistant firing intervals in cylinders 4, 5 and 6.

In European urban driving conditions, the TZA makes possible a fuel reduction of 25 percent vis-a-vis the traditional engine, and about 20 percent in mixed driving.

Direct-Injection Turbo-Diesel

All diesel automobiles presently in production have indirect-injection engines--that is, with precombustion chambers (Mercedes-Benz) or high-turbulence chambers (Oldsmobile, VW, Peugeot, Fiat). With the combustion chambers in two parts, the combustion process proves less efficient, with greater dispersion of heat through the cylinder head.

Direct injection, in which the injector sprays directly against the piston, permits about 5 to 15 percent more fuel-saving than indirect injection. While its use is widespread on diesel truck engines, for which economy is of primary importance, direct injection has not yet been adopted on cars because of its noisiness and the problems of rough engine operation.

The BMW turbodiesel that will go into production around the middle of 1982 represents an innovation in diesel technology. The engine is ready to go into production already, but will be produced in a new plant still to be completed.

Like all other diesel engines for passenger cars, the BMW is of the four-stroke type. Nevertheless, the injection unit is more similar to that of the two-stroke "Detroit" diesel engines of GM than to those presently used on four-stroke direct-injection engines for truck applications.

In substitution for the central dosing or pressurization pump, an inexpensive delivery pump that feeds a number of injector groups (one per cylinder) has been adopted. Each injector provides autonomously for fuel-dosing, establishing the instant of injection, pressurizing the fuel charge, and injection in the form of a jet ready for fast atomization.

The charge is sprayed directly into the cylinder, without a precombustion chamber of any kind, and does not require the use of a heating plug for cold startup.

Combustion is relatively smooth, but that has not been sufficient for BMW, which requires noise levels far lower than those prescribed by law. The noise problem is indeed one of the main reasons why BMW called on outside specialists in the course of the designing of this engine.

Its choice went to an independent research institute, the AVL [expansion unknown] of Graz, Austria, which has been doing advanced research in the field of diesel-engine silencing for more than 25 years.

Noteworthy are the encapsulation techniques developed by the AVL, which consist in a very rigid internal structure enclosed in outer shells formed of compound curves (as is known, shaped panels transmit less noise than flat ones). On the BMW engine, all the noise channels are effectively blocked by insulation, from the manifolds and the tappet cover to the crankcase.

Even if the four-cylinder versions are produced for sale to other builders (Ford), BMW will adopt a six-cylinder in-line version with two cylinder dimensions for displacements of 2.5 and 3 liters.

The objective for the 3-liter was acceleration 10-percent higher than that of the five-cylinder Mercedes-Benz 300 SD Turbo, with consumption 10-percent lower.

Electronically Controlled Four-Speed Automatic Transmission

For several years BMW has been producing cars with longer final ratios and five-speed transmissions, so as to offer the expert driver the possibility of obtaining maximum performance characteristics, maximum economy or any compromise between them.

Moreover, BMW is not neglecting the sector of automatic transmissions, which could have an important role in the future. The problem with manual-shift cars is that there are drivers who, though expert and careful, do not know how to select the right gear at the right time for the purpose of obtaining maximum fuel-savings, especially when they want to use moderate performance characteristics. The car proves more efficient if gear-changing is done without the driver's intervention.

Several of BMW's most important markets require many automatic-transmission cars. For them, the objective is simply to reduce the transmission power losses.

BMW is studying these problems with a research project in which both ZF (Zahnradfabrik Friedrichshafen) and Bosch are collaborating--ZF for the transmission components and Bosch for the electronic part.

An experimental car was made available to me with ZF four-speed automatic transmission equipped with hydraulic torque converter with blocking device and with a four-ratio epicycloidal set with electronic speed-change command.

The blocking device stops the hydraulic flow of the torque converter whenever the mechanical unit proves capable of functioning without knocking, noisiness, irregularity of functioning or loss of efficiency.

Thanks to the electronic control of gear-changing, it becomes possible to select practically any curve of gear-changing points, with extraordinary precision. This approach permits great flexibility in adaptation of the gear-changing, and can be coupled to electronic engine controls (Motronic).

A switch on the dashboard makes it possible to select the gear-changing sequences for maximum fuel-saving, for maximum performance or for urban traffic. After selection of the sequence desired, the electronic unit goes into action, adopting the gear-changing points that correspond best to the driver's intentions. Appropriate electronic safety devices prevent selection of reverse at more than 8 km/hour and overrevolution during manual changes to lower gears at high speeds.

Various studies to optimize and lighten the transmission components are in progress.

Weight Reduction

According to Prog Joachim Elsholz, who is responsible for the body structures, the following possibilities exist for reducing the vehicle's mass:

--reduction of external dimensions while maintaining the same inside space;

--reduction of the dimensions of the materials--that is, new designing of details with use of the same material;

--use of materials of higher mechanical strength in order to reduce dimensions (thinner plates) and weight, with the mechanical strength of the individual components retained;

--combination of separate parts so as to obtain integrated individual organs.

Among the various solutions proposed by BMW's technicians, there is a window-opening device that weighs 1/10 of the one normally used and costs about one-third. The control uses a bidirectional cable instead of the geared mechanism. The control handle has been lightened by 15 percent, by reducing the thickness of the metal at the points of low stress and adopting a hollow section.

By means of stress analysis, a seat back has been optimized by modifying its contours and putting holes in the low-stress zones; the end result is a 10-percent weight reduction and an increase in strength.

Nevertheless, the possibilities of weight reduction by means of such simple systems are very limited, and largely exhausted already. If it is desired to achieve fur-

ther savings, new methods will have to be adopted, such as the finite-elements method, for example, though it has to be kept in mind that the weight-reduction thus achieved could create new problems in other fields (noise, etc).

Since about 80 percent of a car's mass is composed of iron and steel, it is logical to think that weight could be reduced considerably by the use of lighter metals and plastic materials. However, according to Prof Elsholz, the new types of steel with higher mechanical strength and cost not much higher are more promising.

With use of them, all the metal components whose mechanical strength depends on their dimensions can be made with thinner and therefore lighter sections. An important consideration in this regard is that because of the greater strength and higher yielding point of these materials, the other characteristics can be improved too. For example, an engine mount made of steel with a yielding load double that of type St 14 steel can absorb 30-percent more energy during plastic deformation than can St-14 steel.

Similar improvements can be obtained for body plating. With the use of stronger materials it is possible to reduce the thickness of the plate while maintaining or even improving the strength characteristics of the detail parts in question.

In this case, there is the fact that the thin plate costs more.

Prof Elsholz concludes by saying that for all the structural components of the driver-passenger compartment, and therefore for the plate elements that are essential for its mechanical strength, plate will be used that has a yielding load about double that of the steels presently used. The same holds true for the longitudinal structures that must absorb large quantities of energy in case of collision. For the outside covering of the vehicle, a plate will be used that has a considerably higher yielding load, so as to minimize plastic deformations even though smaller thicknesses are used.

BMW is presently reconsidering its own design criteria in various fields. The various covers on the body (hood, trunk lid, sun roof) are presently composed of two shells of plate: the inside one gives the necessary flexion and torsion rigidity and acts as a support for the outside one, preventing vibration of it and making deformation of it difficult. Both purposes can be fulfilled better by adoption of a "sandwich" structure composed of two steel or aluminum panels close to one another and with an expansion layer between them--a solution that offers optimal rigidity in all stress modes.

A further stage of development is that of producing the panel itself in sandwich form before assembly. A sheet of polypropylene or polyamide 0.8 mm thick is placed between sheets of aluminum or steel 0.2-0.3 mm thick. The resultant material can be formed like an ordinary steel plate, with the difference that it weighs about half.

It is also possible that such compound material can cost less than full aluminum plate. Nevertheless, the problem of the repairability characteristics of these materials remains; a great deal of development work is still needed for this problem.

Maintenance-Interval Indicators

For some years, BMW has been interested in the development of electronic systems for providing the driver with information of various types. The engineer Flohr has developed a study that could help to reduce maintenance costs.

Despite the improvements in the last 30 years as regards lubrification and the materials used for the engine and for the chassis, maintenance remains unchanged in a way; indeed, today as in the past, the maintenance intervals are expressed in terms of kilometers run. BMW does not believe that this is a valid criterion, inasmuch as the operating conditions have greater influence on the need for maintenance than does the distance run. The lifetime of the spark plugs, the oil-change interval, etc, can be far greater for long-distance usage than for urban traffic with its frequent stops and starts.

Wear and the levels of thermal stress are far lower in normal driving conditions than in fast driving, which is characterized by sharp accelerations, high speeds and abrupt braking.

To indicate the way the car is really lasting and the need for maintenance, BMW is testing a maintenance-interval indicator. The device is controlled by an electronic minicomputer that receives the data relative to engine running speed, distance traveled, temperature of engine oil, and the time factor. The instrument is composed of an illuminated panel with the legend "Check and change oil," as well as a group of five green-light diodes, one yellow, and three red.

As soon as the ignition switch is turned on, a maximum of five green lights go on; the number of lights lit indicates the period before the next maintenance is due.

When the engine starts up, the green lights go out. If the car needs maintenance, the yellow light stays lit coninuously. If the maintenance time has gone by, the red lights go on. The same thing happens for the annual check that is integrated into the system. When the maintenance has been done, the shop mechanic turns off the lights through the diagnosis plug.

The minicomputer has a memory and an auxiliary battery, so that if the main battery is disconnected, the data in the memory are not erased.

11267
CSO: 3102/93

ALCOHOL FUELS: NO TO SUGAR BEETS, YES TO GRAINS

Stockholm NY TEKNIK in Swedish 29 Oct 81 p 3

[Article by Norbert Andersson]

[Text] Sweden will not invest heavily in ethanol as an automobile fuel in the foreseeable future.

The Sockerbolaget sugar company has given up plans to convert the Karpalund refinery outside Kristianstad to a distillery and the pilot plant for ethanol production in Arlov has been shut down.

Just 1 year ago the thinking was completely different. Beginning in 1983, Karpalund was to produce 90,000 m^3 ethanol annually and before the end of the 1980's Sweden was to produce 400,000 m^3 annually as a gasoline additive.

The ethanol study supported the project and the agriculture minister was enthusiastic.

Energy Proposal Eliminated Market

Last fall, however, the energy proposal eliminated the market for ethanol in one fell swoop. The government proposed that instead of a mixture of methanol or ethanol with gasoline, the main direction should be toward cars that utilize 100 percent methanol as fuel.

Now Sockerbolaget has closed its pilot plant in Arlov and plans to utilize surplus sugar beets to produce automobile fuel have been abandoned.

"The ethanol project is apparently over for us," said Guno Haska, research chief at Sockerbolaget.

"We cannot convert Karpalund without state subsidies. We have already invested several million in experimentation and we cannot pump additional millions into the project if the ethanol market is not guaranteed."

No Loan to Sockerbolaget

Sockerbolaget has made several applications for funds. The Board for Energy Production Research (NE) has said no. In a few weeks the Oil Replacement Fund will also reach a decision, but Guno Haska is sure that the answer again will be no.

This will probably be the death blow to the Karpalund refinery. Conversion to a distillery was almost a prerequisite for the survival of the refinery.

As recently as last year ethanol was seen as the primary alternative to methanol as a gasoline additive.

Methanol is produced primarily from natural gas and it is imported. Because of the sharp price increases in oil several years ago, the Swedish trade balance shifted to a large deficit.

Domestic Fuels Against Deficit

The deficit would be reduced if we replaced some of the imported fuels with domestic fuels. Ethanol is produced primarily from agricultural products, of which Sweden has a surplus. In addition, protein-rich animal fodder is produced as a by-product. We presently import this fodder.

The primary advantages of ethanol are its high energy content and low toxicity and the fact that it does not separate into phases and does not adversely affect the trade balance.

The great disadvantage of ethanol is its relatively high price, up to 2.50 kronor per liter. In terms of energy content, it is twice as expensive as methanol produced from natural gas.

Pilot Plant Receives Funds

Alfa-Laval and Lantmannen are requesting an additional 5 million from the state to construct an ethanol plant in Lidkoping. They are seeking exemption from interest and deferred repayment of loans already granted by the government.

Previously the government promised 30 million kronor in subsidies and loans to the project.

In addition, Alfa-Laval and Lantmannen expect the 8.8 million kronor loan to be remitted after several years, unless the project yields unanticipated profits.

The Oil Replacement Fund will make its decision in early November. If exemption from interest and deferred repayment are not granted, the project probably will be canceled.

"We are expecting a positive answer, however," said Goran Wadmark of Lantmannen and Alfa-Laval has begun planning the project.

Cheaper Method

The so-called Skaraborg project is based on a method developed by Alfa-Laval (see NY TEKNIK, 1980:17). Eventually it could be much cheaper than the process Sockerbolaget planned for Karpalund and Alfa-Laval is dreaming of important export markets, including the United States.

The Lidkoping plant will produce only 600 m^3 ethanol per year. That is a small fraction of what Sockerbolaget had planned for its Karpalund factory.

However, the main purpose of the Skaraborg project is not to produce large quantities of alcohol, but to test the entire process from raw materials to finished ethanol and fodder products.

It could be called a combined experimental and reference facility.

Yeast Fungi Produce

Ethanol is produced by yeast fungi which use the starch in grain. The process runs continuously and uses less water than the Sockerbolaget method. For this reason, less energy is used to evaporate the water from the mash and to dry the residual products.

It is possible to produce 1 liter ethanol and 2 kg concentrated fodder from 3.5 kg grain.

Oljekonsumenterna (OK) has promised to handle the alcohol produced in this way. Lantmannen, which is participating in the project, is also a part owner of OK.

OK has not yet decided how it will use the alcohol. Previously, a blend of up to 10 percent in low-octane gasoline was discussed, but now a lower mixture, about 2 percent, is being considered.

This is similar to the normal amount of carburetor alcohol used in the winter, although it does not increase appreciably the octane rating.

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